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ABSTRACT

A 4-year research project involving 342 handicapped and 202 nonhandicapped children (in grades 1 through 6) was conducted to determine the practicality and impact of assigning special educators to support regular classroom teachers (the stratistician-generalist model). Examined were the following variables: teacher ratings of the student; student perceptions of himself; student perceptions of the classroom climate; achievement test scores; and student's grade level, sex, and classification as handicapped or nonhandicapped. Pre- and posttesting was conducted on students in schools with stratisticians only, in control schools without stratisticians, in schools with resource rooms, and in schools with a combination stratistician-resource room. Among findings were that academic differences between handicapped and nonhandicapped students were not lessened with stratistician involvement, nor were the academic differences between handicapped with and without stratistician help significantly different; that handicapped students in the stratistician-only schools perceived the least cognitive emphasis and variety in their programs; and that students associated with the stratistician program indicated they were less lonely and perceived less classroom misbehavior and unhappiness than students in the other programs. (SBH)

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SPECIAL EDUCATION DELIVERY ALTERNATIVES: CHANGES OVER TIME IN TEACHER RATINGS, SELF-IMAGE, PERCEIVED CLASSROOM CLIMATE AND ACADEMIC ACHIEVEMENT AMONG HANDICAPPED AND NONHANDICAPPED CHILDREN

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Preface

The stratistician model was initiated by the Rocky Mountain Regional Resource Center to explore the practicality and impact of assigning special educators to support regular classroom teachers in their efforts to serve handicapped students in the least restrictive environment appropriate to meet student needs. A basic assumption was that by providing to teachers a school-based, back-up resource person with special education expertise, regular class placement would become appropriate for more handicapped students.

The model was generated over a period of four years with input from educators throughout the state of Utah and consultants from across the nation. The first year was spent in conducting a needs assessment, hiring staff, and working out operating arrangements with representative school districts. Field tests were conducted in a stratified sample of schools for two consecutive years with center-hired stratisticians; also during this time a training manual for the preparation of stratisticians was developed.

Prior to the fourth year (during the summer of 1973), 17 selected special educators from cooperating districts throughout the state of Utah were trained to perform the stratistician role in assigned schools for the following year. Center staff acted as backup and also trained personnel. Before school started in the fall of 1973, however, the school finance formula in Utah was changed, eliminating generation of money based upon program approval; money could be generated only by assignment of children to teachers. Even though extensive agreements had been reached and training had been conducted, the new formula confused the role assignment and function of many of the stratisticians who had been trained for service in the final research year. Some stratisticians were assigned directly to classrooms, some worked with specific students at different times, some worked only with teachers as planned. This unexpected confounding variable confused the supervision and support of the stratisticians during the year; analysis of the data obtained for the intended purposes also became more complex. All data should be reviewed with this limitation in mind.

Extensive pre- and posttesting was conducted on the students in schools with stratisticians only, in control schools without stratisticians, in schools with resource rooms and in schools with a combination stratistician-resource room. Most instruments used were from Project PRIME, a Texas

mainstreaming project. The data analysis indicates that academic differences between handicapped and nonhandicapped students were not lessened with stratistician involvement, nor were the academic differences between handicapped with and without stratistician help significantly different.

Handicapped students in the stratistician-only schools perceived the least cognitive emphasis and variety in their programs. If resource support were facilitating development of Individual Educational Programs it could be assumed more variety would be perceived and that academic success experiences would be built into the individual programs, increasing the students' perception of cognitive emphasis. This did not occur.

Data from students associated with the stratistician program indicated these students were less lonely and perceived less classroom misbehavior and unhappinesss. In addition, teacher ratings in the spring do not discriminate between handicapped and nonhandicapped students as they had the previous autumn. It might be hypothesized from this information that the stratistician did aid teacher acceptance of handicapped students.

In summary, skill in individualizing academic experiences sufficiently to increase success appears limited in this field test; it could be assumed that acceptance of the handicapped by teachers and nonhandicapped students was increased.

The stratistician model is one beginning effort to provide appropriate services to handicapped students in the regular classroom. Increased acceptance by teachers, regular students and the handicapped students themselves is a gigantic first step in any program. From this aspect alone the stratistician model appears to hold promise. It is hoped further research on utilization of a special educator as a support to regular classroom teachers will be conducted and training programs expanded and improved.

Based upon corrected interpretation of the scales used in this study, this document revises an earlier report entitled "Stratistician and Other Special Education Delivery Models: Changes Over Time in Teacher Ratings, Self-Image, Perceived Classroom Climate and Academic Achievement among Handicapped and Nonhandicapped Children," RMRRC, July, 1975.

Judy Ann Buffmire

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SPECIAL EDUCATION DELIVERY ALTERNATIVES: CHANGES OVER TIME IN TEACHER RATINGS, SELF-IMAGE, PERCEIVED CLASSROOM CLIMATE AND ACADEMIC ACHIEVEMENT AMONG HANDICAPPED AND NONHANDICAPPED CHILDREN

Introduction

In the autumn of 1973, the Rocky Mountain Regional Resource Center (RMRRC) in Salt Lake City, Utah, initiated a research program to aid in evaluating the impact on the perceptions and achievement of handicapped school children, and of certain special education teachers who had received previous extensive training and experience under the aegis of the staff of the RMRRC. These teachers had been trained to function in the public schools as "stratistician-generalists," a new job concept in the education of handicapped children. The person filling this role serves primarily as a resource to the regular classroom teacher, and thus as an intermediate link between the teacher and the various services available to the schools. The concept of the stratistician-generalist, where operational, complements the work of the more traditional special education teacher who manages a self-contained classroom or a resource room where children with various kinds of problems receive specialized educational services. The work of the stratistician-generalist is ongoing throughout the school year and includes activities of direct assistance to classroom teachers, resource room teachers, special class teachers, and to local school and district administrators. In addition, during the research phase of the project, stratistician-generalists also provided coordination and implementation of RMRRC programs in the public schools.

To search for the possible correlates of a special education resource to teachers (stratistician-generalist) in certain of the public schools of Utah, the RMRRC staff undertook a program of data collection at two points in time (i.e., Autumn and Spring) during the 1973-74 school year. The general questions to be addressed and answered in this analysis follow:

I. At the beginning of the school year, what are the relationships between a set of responses to reliable measures of:

   a. teacher ratings of the student,

b. student perceptions of himself,

c. student perceptions of classroom climate,

d. achievement test scores, and

e. the student's

1. grade level,

2. sex, and

3. classification as handicapped or nonhandicapped?

II. For the measures in I above, what relationships remain and what new relationships emerge when these same data are again collected and analyzed at the end of the school year? That is, after scores from the first of the year are included in the second analysis as a covariate control, what differences from the first analysis still remain at the second analysis and what new differences emerge?

III. When only the scores of handicapped children are analyzed, what relationships emerge at the first and second measurement periods between the student's scores and his

a. grade,

b. sex, and

c. exposure to the type of special education resource program operating in his school?

While the major research question pertains to the relationship between these scores and the student's exposure to the stratistician-generalist program, it is of important educational interest to examine differences between handicapped and nonhandicapped children as well, and look at the pattern of differences which occurs when grade level and sex are used as additional grouping variables.

Method

Subjects, Schools and Districts

At the beginning of the 1973-74 school year, the RMRRC placed 17 specially trained stratistician-generalists in 17 schools which represented 11 of the 40 school districts in the state of Utah. In addition, two contrast schools were selected (Buffmire, 1974). The student subjects included all students in grades 1 through 6 in the participating schools. Approximately 300 teachers participated in completing one of the measures used in the analyses reported here, and in administering the remaining measures to the students. Complete data for all the instruments used in these analyses were found for 342 handicapped and 202 nonhandicapped children on the social-emotional scales and for 314 handicapped and 1,454 nonhandicapped children on the achievement test data.

Designs

The design used for the first set of analyses between handicapped and nonhandicapped children at both the beginning and at the end of the 1973-74 school year was a 2 x 2 x 2 factorial. The design factors for these first analyses were as follows:

1. Handicapped/nonhandicapped status,
2. Sex,
3. Grade level: grades 1-3 or 4-6.

The social-emotional scales and achievement tests used in this first set of analyses were adapted from some of those used in a previous large scale study in Texas called Project PRIME (Kaufman & Agard, 1973). The results of the analyses of the achievement test data will be reported following the analyses of the social-emotional scale data. These social-emotional scales, which will be described in the next section, were labeled as follows:

1. Teacher Rating Scale,
2. About You and Your Friends,
3. Your School Days.

The complete factorial for the first set of analyses is illustrated in Figure 1.

The design used for the second set of analyses at both the beginning and the end of the 1973-74 school year was a 4 x 2 x 2 factorial. This design analyzed only the data for handicapped children. The design factors for the second analyses were as follows:

1. Special education program status:

   a. traditional resource room, N = 7 schools,

   b. combination resource room/stratistician, N = 7 schools,

   c. stratistician-generalist, N = 3 schools,

   d. contrast schools (no RMRRC involvement), N = 2;

2. Sex: male or female;

3. Grade level: grades 1-3 or 4-6.

The complete factorial for the second set of analyses is shown in Figure 2.

It should be recognized that the Special Education Program Status design factor is at best an indirect categorization. That is, any significant F ratios associated with this factor would not necessarily reflect the "direct effects" of a special education program type because of the nature of the stratistician-generalist concept. The person filling this job role in the school works with the teacher as a resource.

Variables

With the exception of the Metropolitan Achievement Test, all measures used as criterion variables in these analyses were adapted from the Project PRIME study conducted in Texas. Three of these instruments were used in the data collection of the present RMRRC study; the scale structures and factor analytic methods used in developing them are found in various Project PRIME working papers published by the project (Veldman, 1974). Figure 3 lists the variables derived from these instruments. Each of the scales from these three instruments was constructed such that a low scale score means that a high amount of the

Grade Level	Handicapped		Nonhandicapped		
	Male	Female	Male	Female	Totals
Grade 1-3	127	58	36	42	263
Grade 4-6	97	60	62	62	281
Totals	224	118	98	104	544

Figure 1. Design for analysis of differences between handicapped and non-handicapped students, by sex and grade level.

Program Type	MALE		FEMALE		TOTALS
	GRADES 1-3	GRADES 4-6	GRADES 1-3	GRADES 4-6	
Resource Room	51	31	19	9	110
Resource Room Strat.	33	28	20	29	110
Strat.	26	22	12	13	73
Contrast	17	16	7	9	49
Totals	127	97	58	60	342

Figure 2. Design for analysis of differences for handicapped students between program, sex and grade.

Variable Number	Description	Instrument	Data Supplied By
1	Academic Concentration	Teacher Rating Scale	Teacher
2	Antisocial Behavior		
3	Outgoing, Expressive		
4	Anxious, Depressed		
5	Loneliness and Rejection	About You and Your Friends	Child
6	Enjoys School		
7	Does Well in School		
8	Misbehavior		
9	Enjoyment, Positive Reinforcement	Your School Days	Child
10	Unhappiness, Misbehavior		
11	Cognitive Emphasis		
12	Variety, Individualization		

Figure 3. Variable names and sources

measured variable is being rated by the teacher or subscribed to by the student.

Teacher Rating Scale (TRS)

This instrument is a five-point rating scale completed by the teacher on the target student and consists of 85 items which yield scores on four factor scales labeled as follows:

a. Academic Concentration (e.g., teacher sees student as: "Needs constant supervision." "Finishes on time.");

b. Antisocial Behavior (e.g., "Attempts to dominate or bully other children." "Is well behaved in school.");

c. Outgoing, Expressive (e.g., "Is spontaneous in contributing ideas." "Contributes to class discussion.");

d. Anxious, Depressed (e.g., "Becomes upset when makes a mistake." "Expresses feelings of inadequacy about self.").

About You and Your Friends (AYYF)

This instrument was administered to the student by the teacher, with the student responding "yes" or "no" on his answer sheet. The instrument consists of 96 items in the general area of perceived self-image and provides four factor scale scores as follows:

a. Loneliness and Rejection (e.g., "Is it hard for you to make friends?" "Do your classmates make fun of you?");

b. Enjoys school (e.g., "Do you like school?" "Is school interesting to you?");

c. Does Well in School (e.g., "Are you smart?" "Do you write good stories and reports?");

d. Misbehavior (e.g., "Do you get into trouble in school?" "Do you fight too much?").

Your School Days (YSD)

An instrument designed to measure student perceptions of classroom climate, it consists of 65 questions to which each student responds by writing "yes" or "no" in his answer booklet. Following a four-factor rotation, the following scales were derived:

a. Enjoyment, Positive Reinforcement (e.g., "Do the children enjoy their school work in your class?" "Does your teacher reward you when you do good work?");

b. Unhappiness, Misbehavior (e.g., "Are most of the children unhappy in your class?" "Are the children in your class always fighting with each other?");

c. Cognitive Emphasis (e.g., "When your teacher asks you a question, is it important to give reasons for your answers?" "Does your teacher tell you reasons why you shouldn't do something?");

d. Variety, Individualization (e.g., "Do different projects go on at the same time in your room?" "Can you use the class games and learning equipment without the teacher watching you?").

Metropolitan Achievement Test (MAT)

The MAT contains forms for four grade levels: Primary I, Primary II, Elementary and Intermediate. Subtests include: Word Knowledge, Word Analysis (PI and PII only), Reading, Total Reading, Mathematics Computation (PII, Elementary and Intermediate only), Mathematics Concepts (PII, Elementary and Intermediate only), Mathematics Problem-Solving (PII, Elementary and Intermediate only), and Total Mathematics. The scores used in the analyses reported here (see page 49) are grade equivalents for the four subtests of Word Knowledge, Reading, Total Reading and Total Math only.

Data Analysis and Results

The data were analyzed by means of a multivariate analysis of variance (MANOVA) computer program devised by Clyde, Cramer and Sherin (1966). The MANOVA program provides multivariate F tests for the hypotheses pertaining to the effects of the design factors and their interaction on the variables. The significance of any multivariate root is tested by the Wilks-Lambda criterion. If one or more multivariate F ratios associated with a design factor or interaction among design factors is significant, this indicates, among other things, that when all the variables are combined to form a multivariate dimension, that dimension associated with the significant multivariate F test provides maximum discrimination among the subject groups created by the design factor in question. This multivariate dimension is referred to in the MANOVA program as a "principal component of the hypothesis." It consists of a certain combination of all the variables and can be labeled by noting which of the separate variables receives the highest "weight." The correlation coefficients between each variable and the principal component are provided for ease in labeling the component. In this way, each subject group can be placed on the principal component by means of its contrast score. This feature of the MANOVA program provides, then, a descriptive example of how groups of subjects differ from each other in terms of some multivariate dimension.

In addition to these multivariate features of the MANOVA program, a list of the usual univariate F tests for each of the variables is obtained, as well as the means associated with each of these F tests. In addition, the program also provides a within-cells correlation matrix for the relationship between each variable and all other variables. There are two important reasons for using a multivariate statistical technique such as MANOVA when the researcher is examining data for differences among subject responses which have been grouped in some a priori way. First, it is simply more efficacious to examine differences which occur when many single variables can be combined to produce one overall basis for discrimination. Second, because many variables are correlated or dependent upon each other in unknown ways, an analysis of each of them, one at a time, cannot control for the spurious effect of this intercorrelation on any series of single univariate F ratios. The MANOVA program provides, therefore, a way of examining the intercorrelation among the variables to be tested; judgments can also be made about two separate significant F tests of two different variables that

are seen to be highly correlated. This capability at least raises the question of whether to include both of the measures and to test them when one is seen as highly correlated with the other.

Social-Emotional Scale Results

The report of the results will begin with a consideration of the first set of analyses and focus on the overall differences between handicapped and nonhandicapped children, between grade levels, and between the sexes. This will be followed by a report of the second set of analyses which focuses on differences within the group of handicapped children, with special attention given to differences according to the type of special education program to which the children were differentially exposed. This section of the report will then conclude with a discussion of these results.

Analysis I

It will be recalled that the design for the first set of analyses was a 2 x 2 x 2 factorial where grade level, sex, and classification as handicapped or nonhandicapped were the design factors, and where the 12 scale scores, four each from the instruments Teacher Rating Scale, About You and Your Friends, and Your School Days, comprised the criterion variables. The results from the Autumn, 1973 and Spring, 1974 scale administrations will be reported separately. (In the following narrative, these two test administrations will be referred to as Autumn and Spring without reference to the years.)

Autumn, 1973. An inspection of the within-cells correlation matrix (not reported here), which reports the relationships among all 16 criterion variables, warrants the decision to first examine the multivariate nature of these data before examining the univariate results. The correlation matrix indicates a number of substantial correlations throughout the table. This is particularly true for the four scales of the Teacher Rating Scale. Here the first scale, Academic Concentration, correlates -.500 with Scale 2, Antisocial Behavior; .591 with Scale 3, Outgoing, Expressive; and -.394 with Scale 4, Anxious, Depressed. Scale 2 (Antisocial Behavior) shows no substantial correlations with 3 and 4, but Scale 3 (Outgoing, Expressive) correlates -.349 with Scale 4 (Anxious, Depressed). The inverse correlations might be expected on common sense grounds, but the positive correlation between Scales 1 and 3

suggests both scales are measuring something redundantly similar. The second instrument, which measures the student's self-image, shows considerable overlap between Scales 1 (Loneliness, Rejection) and 4 (Misbehavior); i.e., r = .660, and between Scales 2 (Enjoys School) and 3 (Does Well in School), i.e., r = .665. The third instrument, Your School Days, is a measure of classroom climate in the student's view. Scale 1 (Enjoyment, Positive Reinforcement) correlates .342 with Scale 3 (Cognitive Emphasis), and .478 with Scale 4 (Variety, Individualization). And, as might be expected, Scales 3 and 4 correlate .414.

Notably, the scales from any one of the three instruments do not correlate highly with scales from any one of the other instruments, with one exception. There is a moderate correlation of .328 between Scale 2 (Enjoys School) from AYYF and Scale 1 (Enjoyment ,Positive Reinforcement) from YSD. The within-cells correlation analysis suggests that these three measures (teacher rating, student self-image, and classroom climate) are sufficiently discrete from each other to credit their differential interpretation when administered to the same subjects. It suggests as well that within each of the instruments, considerable overlap among scales precludes treating any scale with high overlap as unidimensional and thereby moderates the interpretation of significant univariate differences between subjects on the scale in question.

In the reports of multivariate and univariate results which follow, only significant effects will be included. In Analysis 1 of the Autumn administration, there were no significant multivariate two-way or three-way interaction effects among the three design factors. However, each of the three design factors proved significant as main effects. Table 1 contains the results from the tests of the main effect of the grade level factor.

In Table 1 it can be seen that the multivariate F = 13.621 is significant at beyond .001, indicating two points: the 12 scale scores provide a multivariate dimension on which students can be meaningfully discriminated according to grade level; and that one or more of the 12 scales will likely provide a univariate basis for discriminating between grade levels. Figure 4 illustrates the principal component (multivariate dimension) which discriminates students according to their placement in grade level 1-3 or 4-6. An inspection of the list of coefficients of this principal component (see Table 1, p. 14) suggests that it can be given tentative definition as "Enjoyment, Positive

Table 1

Analysis 1, Autumn, 1973: Multivariate and Univariate Results and Principal Component Coefficients Associated with Grade Level

Multivariate Analysis

F	df	p
13.621	12/501	$<.001$

Univariate Analysis

Variable	F (df=1/512)	p less than	Principal Component Coefficients
1. Academic Concentration	3.168	.076	.138
2. Antisocial Behavior	.461	.498	- .053
3. Outgoing, Expressive	7.271	.007	.209
4. Anxious, Depressed	6.213	.013	- .193
5. Loneliness, Rejection	3.089	.079	- .136
6. Enjoys School	.058	.810	.019
7. Does Well In School	14.263	.001	.292
8. Misbehavior	15.977	.001	- .309
9. Enjoyment, Positive Reinf.	63.372	.001	.616
10. Unhappiness, Misbehavior	4.120	.043	.157
11. Cognitive Emphasis	5.077	.025	- .174
12. Variety, Individualization	4.869	.028	.171

Figure 4. Principal Component Associated With Main Effect of Grade Level Factor for Analysis 1, Autumn, 1973.

Reinforcement." Since this scale variable shows the highest correlation with the component; i.e., .616, we can now ask how the students, in terms of their grade level, differ on this principal component. The contrast scores for each grade level group help provide this information. The score for the grade level 1-3 is -.561 and +.561 for the group at grade level 4-6 (see Figure 4). Because they have the lower scores on the AYYF Enjoyment scale, younger students perceive their classroom climate in terms of enjoyment and positive reinforcement significantly more than do older students. Further inspection of the coefficient list in Table 1 suggests that any student's composite score on the principal component is also moderately determined by his or her individual score on Scale 8, Misbehavior, i.e., coefficient -.309. Thus, older students also perceive themselves misbehaving more often than do younger students. Univariate F test results will not be reported here, but Table 1 reports that seven of the F tests for these scales were significant. In the analysis of the Spring results, it will be seen later that while this particular component gets relabled, it is still the effect of perceived classroom climate that again provides discrimination between grade levels.

The results of the effects associated with the sex factor are reported in Table 2, which indicates a significant multivariate F of 7.572 for the effect of the sex factor. This multivariate F for sex carries with it five significant univariate F ratios as well, indicating numerous ways in which to discriminate among students according to sex. The most efficient way to describe these differences is provided by the principal component of the hypothesis of sex. Inspection of the list of coefficients in Table 2 indicates that a dimension labeled, Negative: Rated and Perceived Misbehavior/Positive: Academic Concentration, might be affixed to this component. The component is illustrated in Figure 5.

The principal component coefficients for Scales 1 and 2 (Teacher-Rated Academic Concentration and Antisocial Behavior) and 8 (Self-Rated Misbehavior) provide the definition of the component. A contrast score of +.477 for boys and -.477 for girls suggests that teachers rate boys as more misbehaving, as showing less academic concentration, and boys perceive themselves as more misbehaving in their classes than girls. These differences according to sex will be seen to disappear on analysis of the Spring results.

Table 2

Analysis 1, Autumn, 1973: Multivariate and Univariate Results and Principal Component Coefficients Associated with Sex

Multivariate Analysis

F^2	df	p
7.572	12/501	<.001

Univariate Analysis

Variable	F (df=1/152)	p less than	Principal Component Coefficients
1. Academic Concentration	29.222	.001	.561
2. Antisocial Behavior	38.933	.001	-.648
3. Outgoing, Expressive	2.507	.114	.164
4. Anxious, Depressed	.196	.658	-.046
5. Loneliness, Rejection	.176	.675	.043
6. Enjoys School	11.435	.001	.351
7. Does Well In School	.000	.994	-.001
8. Misbehavior	22.928	.001	-.497
9. Enjoyment, Positive Rein.	2.750	.098	.172
10. Unhappiness, Misbehavior	8.475	.004	-.302
11. Cognitive Emphasis	.199	.655	-.046
12. Variety, Individualization	.617	.433	.081

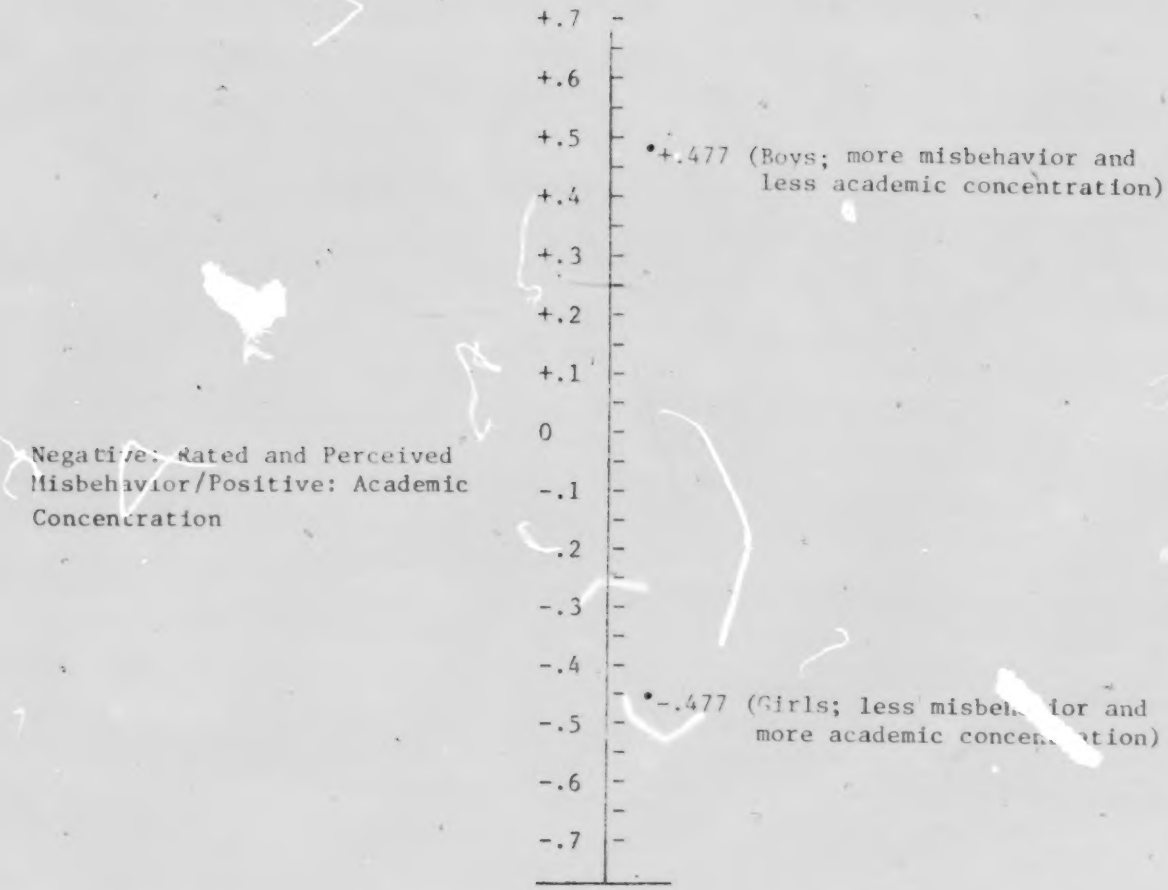

Figure 5. Principal Component Associated with Main Effect of Sex Factor for Analysis 1, Autumn, 1973.

Table 3 includes the results for analysis of the effects associated with the design factor of handicapped/non-handicapped. As one might expect, the most significant effects are associated with this factor compared with grade level and sex (see Tables 1 and 2). As a means of grouping students, the classification factor differentiates between them more strongly than the other two factors. Inspection of Table 3 indicates a multivariate $F = 16.891$, $p < .001$ for the handicapped/nonhandicapped classification factor; moreover, it shows that the teacher ratings (Scales 1, 2, 3, and 4) comprise the largest univariate F ratios for all 12 of the scales. Even so, the univariate F ratio for scale variable 5 (Loneliness, Rejection) provides good discrimination; this is notable because this is a self-image measure to which the students responded. In any case, for now the multivariate dimension will be described followed by a report of certain of the univariate F ratios and their corresponding means.

Figure 6 illustrates the bipolar principal component of the classification hypothesis. Using the list of coefficients from Table 3 to label this bipolar component, one might select scale variables 1, 3, and 4 and name the component Teacher Rating since it is the component coefficients from the Teacher Rating scale which dominate this multivariate dimension. The component discriminates between handicapped children who are rated by their teachers as showing less academic concentration, as being less outgoing, but as being more anxious than are non-handicapped or normal school children. The means associated with the significant univariate F ratios for Scales 1, 3, and 4 (see Table 3, p. 20) provide further detail. Table 4 contains the means for handicapped and nonhandicapped students on the scale variables of: 1) Academic Concentration; 2) Outgoing, Expressive; and 4) Anxious, Depressed. The analysis of these same data at the Spring administration will show some interesting changes over time when scores from the prior analysis are included to allow for initial differences among handicapped and non-handicapped students.

Table 3

Analysis 1, Autumn, 1973: Multivariate and Univariate Results and Principal Component Coefficients Associated with the Classification Factor

Multivariate Analysis

F	df	p
16.891	12/501	<.001

Univariate Analysis

Variable	F(df=1/501)	p less than	Principal Component Coefficients
1. Academic Concentration	177.069	.001	.925
2. Antisocial Behavior	20.107	.001	-.312
3. Outgoing, Expressive	82.033	.001	.629
4. Anxious, Depressed	39.091	.001	-.434
5. Loneliness, Rejection	11.511	.001	-.236
6. Enjoys School	.638	.425	-.055
7. Does Well In School	2.490	.115	.110
8. Misbehavior	7.693	.006	-.193
9. Enjoyment, Positive Reinf.	1.515	.219	-.086
10. Unhappiness, Misbehavior	4.566	.033	-.148
11. Cognitive Emphasis	4.166	.042	.142
12. Variety, Individualization	1.411	.235	.083

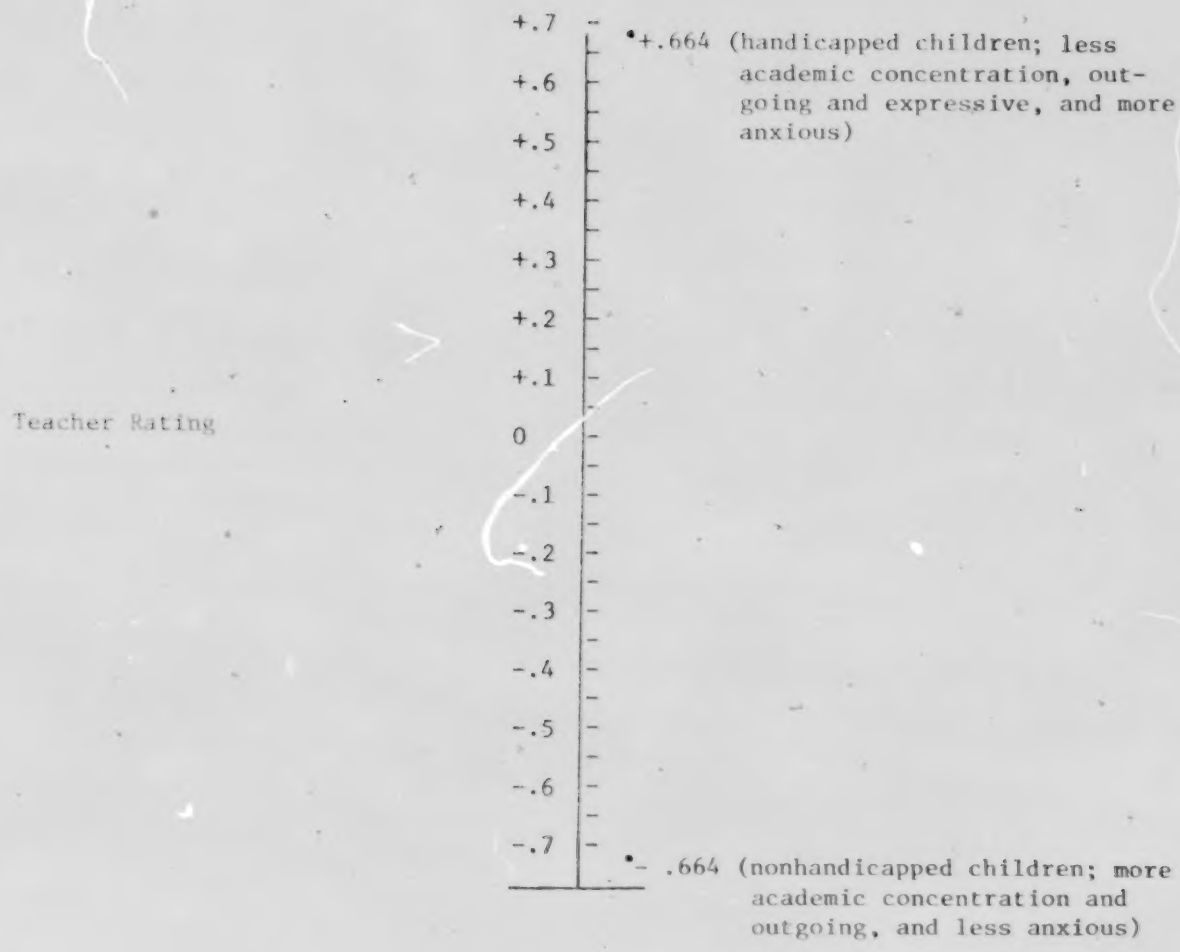

Figure 6. Principal Component Associated with Main Effect of Classification Factor for Analysis 1, Autumn, 1973.

Table 4

Analysis 1, Autumn, 1973: Selected Means for Handicapped and Nonhandicapped Students from Scales 1, 3, and 4

		Handicapped	Nonhandicapped
Scale 1:	Academic Concentration	131.19	94.73*
Scale 3:	Outgoing, Expressive	18.81	14.73*
Scale 4:	Anxious, Depressed	16.91*	19.09

*lower mean = higher teacher rating of the trait name.

Spring, 1974. The design for the first analysis of the Spring data is identical with that for the Autumn analysis (see Figure 1, p. 5) with one major exception. The latter analysis included all scores from Autumn as covariates. In this way, differences from the prior analysis were equated so that any differences which would emerge for the Spring analysis could be seen as independent of these earlier effects. This permits holding these earlier differences constant to determine whether and how differences at the second analysis are now related to the factors of classification, grade level, and sex. Even so, use of this number of covariates makes a strict interpretation of differences problematic.

The results of the within-cells correlation analyses are substantially the same as they were in the Autumn analysis. The only notable differences in the patter of intercorrelations among the 12 scale variables is that the four scales from the Teacher Rating Scale are now less highly related. Where before variable 1 (Academic Concentration) was highly related to the other three scales, it now relates only with variable 3 (Outgoing, Expressive) at $r = .692$.

In this Spring analysis, none of the interaction effects among design factors nor the sex factor were significant as a way of discriminating between student responses ($F_{sex} = 1.654$, df = 12/489, $p < .074$). It will be recalled that boys had been clearly discriminated from girls on the basis of teacher ratings of boys' greater antisocial

behavior and boys' own perceptions of more misbehavior in their classes than girls.

However, grade level and classification as handicapped or nonhandicapped did remain as significant ways for differentiating among these students. The multivariate F for the grade level factor was $F = 4.853$, $p < .001$. These results are reported in Table 5 where the reader can then compare them with the earlier results for this same factor at Autumn (see Table 1, p. 14). Fewer of the scale variables are significant this time as variables 1, 8, 9 and 10 drop out, and variable 2 (teacher-rated Antisocial Behavior) is picked up as significant. This changes the principal component on which students are to now be differentiated. Before (see Figure 4, p. 15), the component was "Enjoyment, Positive Reinforcement," indicating that discrimfnation was primarily provided by that portion of perceived classroom climate dealing with this variable, number 9. Now, discrimination is seen to consist of a negative dimension that--using variables 2, 11 and 4 from a list of coefficients in Figure 7--might be labeled "Negative: Cognitive Emphasis, teacher-rated Antisocial Behavior, Anxious." Thus, children in grades 1-3 perceive less cognitive emphasis in their classes than do older children and this is, then, more of an increase or change from Autumn to Spring for younger than older students. They are also rated by their teachers as more Antisocial than children in grades 4-6, again reflecting a greater increase than for older students across time. Previous differences according to a perceived enjoyable classroom climate are now eclipsed by increased negative teacher ratings of younger students and by their own perceptions about classroom cognitive emphasis. Clearly then, differences between grades at the earlier analysis do not predict the nature of subsequent differences between them, although differences can still be found at the later analysis.

Differences between handicapped and nonhandicapped students still remain for the Spring analysis but there are considerably fewer of them. These results are reported in Table 6 where the F for the classification factor is 2.029. In the analysis for Autumn (see Table 3), there were eight significant differences to be examined. Here, there are only three which remain as significant, i.e., Academic Concentration; Loneliness, Rejection; and Variety, Individualization. Using variables 1, 5 and 12 from the list of coefficients from Table 6 suggests that the discriminating principal component can be given tentative definition as "Negative: Perceived Variety; Loneliness, Rejection; and Positive: Academic Concentration" (see

Table 5

Analysis 1, Spring, 1974: Multivariate and Univariate Results and Principal Component Coefficients Associated With Grade Level

Multivariate Analysis

F	df	p
4.853	12/489	$<$.001

Univariate Analysis

Variable	F	p less than	Principal Component Coefficients
1. Academic Concentration	.861	.354	.120
2. Antisocial Behavior	6.494	.011	-.330
3. Outgoing, Expressive	2.697	.101	.213
4. Anxious, Depressed	5.917	.015	-.315
5. Loneliness, Rejection	.492	.483	.091
6. Enjoys School	.315	.575	-.073
7. Does Well in School	3.907	.049	.256
8. Misbehavior	3.224	.073	-.233
9. Enjoyment, Positive Reinf.	2.703	.101	.213
10. Unhappiness, Misbehavior	5.253	.022	.297
11. Cognitive Emphasis	7.458	.007	-.354
12. Variety, Individualization	.018	.892	-.018

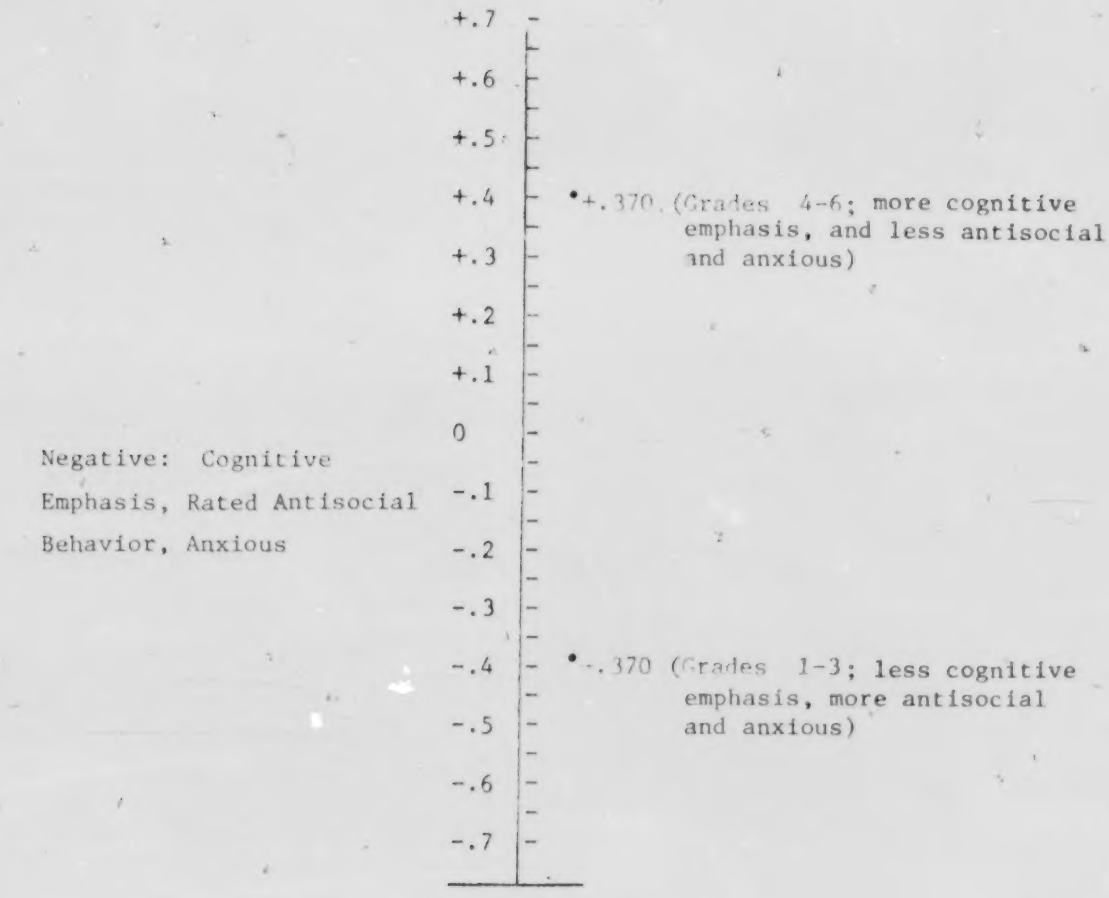

Figure 7. Principal Component Associated with Main Effect of Grade Level for Analysis 1, Spring, 1974.

Table 6

Analysis 1, Spring 1974: Multivariate and Univariate Results and Principal Components Associated With Classification Factor

Multivariate Analysis

F	def	p
2.029	12/489	<.020

Univariate Analysis

Variable	F(df=1/500)	p less than	Principal Component Coefficients
1. Academic Concentration	5.573	.019	.473
2. Antisocial Behavior	.083	.773	.058
3. Outgoing, Expressive	2.777	.096	.334
4. Anxious, Depressed	.250	.617	-.100
5. Loneliness, Rejection	5.011	.026	-.449
6. Enjoys School	.482	.488	.139
7. Does Well In School	2.220	.137	.299
8. Misbehavior	2.786	.096	-.335
9. Enjoyment, Positive Rein.	1.792	.181	-.268
10. Unhappiness, Misbehavior	1.590	.208	-.253
11. Cognitive Emphasis	.002	.960	.010
12. Variety, Individualization	7.504	.006	-.549

Figure 7). In other words, each of the three instruments enter significantly into the discrimination between handicapped and nonhandicapped students. The principal component is given in Figure 8 where it can be seen that maximum discrimination for the classification factor is best provided by a multivariate dimension whose properties are the differentially negative and positive responses about these students. This means the character of multivariate differences is a factor dominated primarily by the contribution of scores from scale variables 1, 5, and 12, or from each of the three instruments. Table 7 contains the means associated with the variables. As in the previous analysis, handicapped students are still rated by their teachers as evidencing less academic concentration than nonhandicapped students. Apparently, the teacher still finds these former students less academically involved. The nonhandicapped students perceive themselves as somewhat less lonely and rejected than do handicapped students. Loneliness and rejection, as a measure of self-image, retains the power to differentiate at the Spring measurement, but now contributes more heavily to the determination of the multivariate nature of the differences between these two groups. The mean difference between the two groups on the perceived climate of variety and individualization, while statistically significant, would seem to be of little educational significance.

Table 7

Analysis 1, Spring 1974: Means for Handicapped and Nonhandicapped Students from Scales 1, 5 and 12*

	Handicapped	Nonhandicapped
Scale 1: Academic Concentration	128.18	98.69
Scale 5: Loneliness, Rejection	29.15	31.41
Scale 12: Variety/Individualization	11.09	11.14

*lower mean = higher amount of variable measured

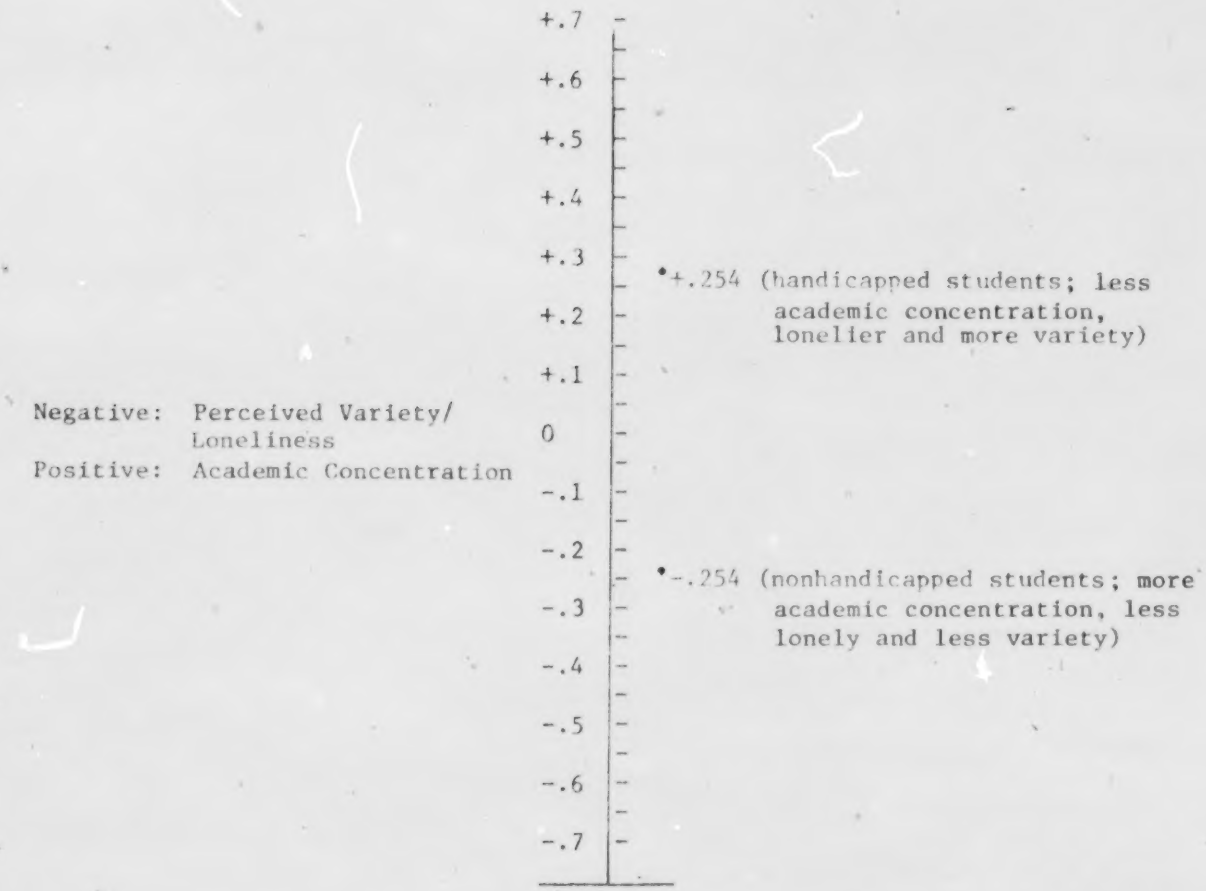

Figure 8. Principal Component Associated with Main Effect of Classification for Analysis 1, Spring, 1974.

In summary, it can be stated that when the differences between handicapped and nonhandicapped students which occur in the analysis of Autumn data are controlled for in the analysis of Spring data, there are no longer any differences due to significant increases or decreases between these groups with regard to teacher-rated anti-social behavior, outgoingness, anxiety, the student's self-attribution of loneliness and misbehavior, or his perception of the classroom climate as characterized by unhappiness and a cognitive emphasis. This is not to say that these differences do not exist at the Spring measurement period. Rather, it is just that they are no longer effective as ways of distinguishing or characterizing handicapped and nonhandicapped students. In one sense, these two groups become similar over time, and in terms of teacher ratings, more favorably so for handicapped students. Evidently, handicapped students also, like their counterparts, are not different in the way they actribute misbehavior to themselves, and again, like their nonhandicapped peers, do not report a greater increase in how much unhappiness and misbehavior they perceive as characteristic of their classroom climate. Where they remain different from nonhandicapped students over time resides in how their teachers rate them as again showing significantly less academic concentration than their normal peers.

Analysis 2

The second set of analyses of data from the two points in time concern handicapped students only. The design factors were, again, grade level, and sex and the addition of a program factor representing the type of special education program to which the student was exposed (see Figure 2, p. 6): i.e., 1) traditional resource room, 2) resource room/stratistician-generalist mixture, 3) stratistician only, and 4) contrast schools (no RMRRC program involvement). The variables used were identical to those included in the first set of analyses, i.e., the 12 scale variables.

Autumn, 1973. The within-cells correlation matrix for the analysis of the Autumn data repeats the pattern for the previous analysis comparing handicapped and nonhandicapped students. As before, the teachers' rating of variable 1 (Academic Concentration) shows the highest intercorrelations with the three other variables in the Teacher Rating Scale, i.e., $r_{1,2} = -.468$; $r_{1,3} = .538$ and $r_{1,4} = -.354$. As well, handicapped students' responses

on their perception of their Loneliness (5) and their own Misbehavior (8) correlate .725, as do their responses for Enjoys School (6) and Does Well in School (7) $r_{6,7} = .702$. Finally scores on Enjoyment, Positive Reinforcement (9) and Variety, Individualization (12) correlate .417.

Inspection of the MANOVA results indicated that the three-way multivariate interaction effect among program, sex and grade level was not significant ($F = 1.251$, $p < .150$), nor were the two-way multivariate interactions between sex and grade level ($F = .558$, $p < .875$), or between program and sex ($F = 1.310$, $p < .107$). The two-way multivariate interaction between program and grade, however, was significant ($F = 1.638$, $p < .011$). These results are reported in Table 8 where it can be seen that significant univariate differences occur on scale variables 5, 7, and 10. The principal component associated with this interaction effect seems best described as a combination of "Does Well in School/Loneliness, Rejection" (see Figure 9). The component provides maximum discrimination between students at grades 4-6 in the resource room only program type who are likely to say they are less lonely and doing better in school, and the students in grades 4-6 in the Contrast Schools who are lonelier and those students in grades 4-6 in the Resource Room/Stratistician program who say they are doing less well in school. Clarification of these differences is provided by Table 9 where the means for each of the eight groups constituted by the interaction effect are reported. There, maximum univariate differences are found between older handicapped students in the resource room/stratistician program type who perceive themselves as lonelier than older students in the contrast schools category, and older students in the resource room category. With regard to the self-rating of "Does Well in School," younger students report greater feelings of academic success than do older students in every program type except the Resource Room/Stratistician. The combination Resource Room/Stratistician program type generally appears to reduce feelings of academic inadequacy for older students when compared with the other program types. On the "unhappiness/misbehavior" scale, older students generally report less of these feelings than younger students. On the principal component (see Figure 9) Loneliness, Rejection will be seen to occur again as a means of discrimination for the same interaction at the Spring analysis.

When differences among handicapped students are examined in terms of grade level, the multivariate F is significant (i.e., $F = 2.505$, $p < .001$), and in the same ways as were

Table 8

Analysis 2, Autumn, 1973: Multivariate and Univariate Results and Principal Component Coefficients for Interaction Between Program and Grade Level

Multivariate Analysis

F	df	p
1.638	36/931.43	<.011

Univariate Analysis

Variables	F (df=3/326)	p less than	Principal Component Coefficients
1. Academic Concentration	1.167	.322	.253
2. Antisocial Behavior	2.550	.056	-.319
3. Outgoing, Expressive	.455	.714	.011
4. Anxious, Depressed	1.222	.302	-.281
5. Loneliness, Rejection	3.135	.026	.532
6. Enjoys School	.991	.397	.270
7. Does Well In School	4.566	.004	.662
8. Misbehavior	1.489	.217	.394
9. Enjoyment, Positive Reinforcement	1.108	.346	-.284
10. Unhappiness, Misbeh.	3.087	.027	.153
11. Cognitive Emphasis	.400	.753	-.142
12. Variety, Individualization	1.435	.232	.053

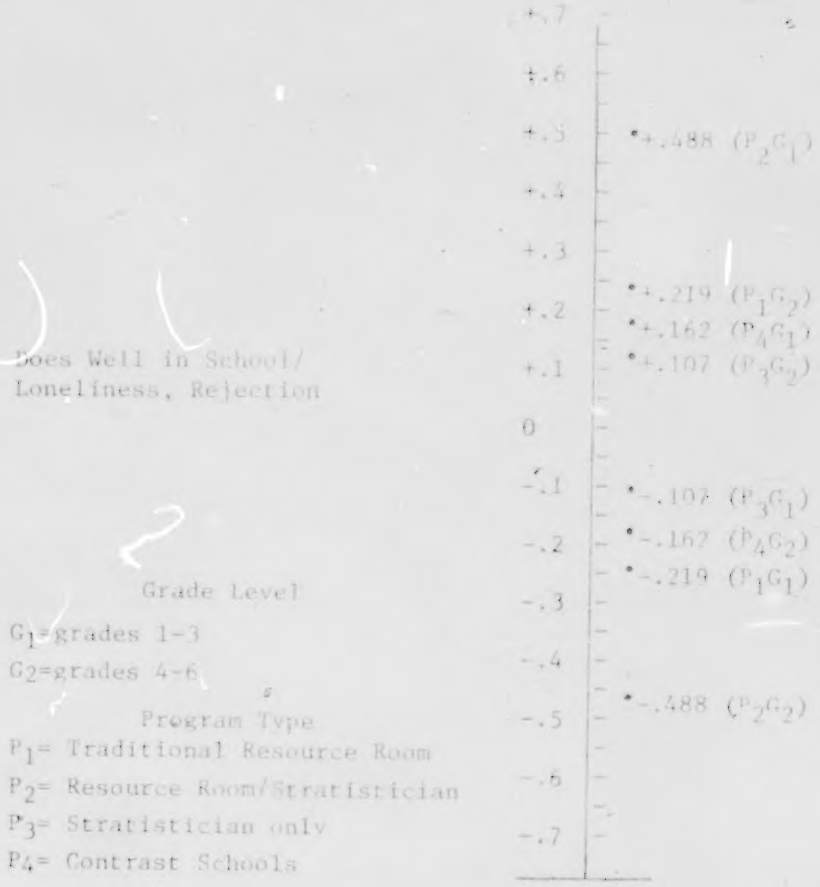

Figure 9. Principal Component Associated with Interaction Between Program and Grade for Analysis 2, Autumn, 1973.

Table 9

Analysis 2, Autumn 1973: Means for Program and Grade Interaction on Loneliness, Rejection (5); Does Well in School (7); and Unhappiness, Misbehavior (10)*

Program/Grade	(5) Loneliness, Rejection	(7) Does Well in School	(10) Unhappiness Misbehavior
P_1G_1	29.69	28.29	21.40
P_1G_2	30.19	31.43	22.65
P_2G_1	30.12	27.83	21.28
P_2G_2	25.60	26.46	21.50
P_3G_1	29.39	26.97	21.44
P_3G_2	27.97	31.70	22.00
P_4G_1	29.90	26.77	22.65
P_4G_2	30.60	31.19	22.20

*lower mean = higher amount of variable measured

Program Type	Grade Level
P_1= Resource Room Only	G_1=1-3
P_2= Resource Room/Stratistician	G_2=4-6
P3= Stratistician Only	
P = Contrast Schools (no RMRRC involvement)	
4	

true for grade differences when handicapped students were compared with nonhandicapped students in Analysis 1 (see Table 1, p. 14). Table 10 contains these results for handicapped students. The principal component appears to be a dimension that can be given tentative definition as: Enjoyment, Positive Reinforcement. Figure 10 illustrates the principal component, and it is identical with the component identified with grade level differences in Analysis 1 in Figure 4. Again, younger students perceive somewhat more enjoyment and positive reinforcement in their classroom climate.

In the same way that the sex factor discriminated between the sexes in Analysis 1 at Autumn, it does so again for handicapped students considered by themselves. These results will not be reported in detail here except to point out that the multivariate $F = 2.879$, $p < .001$, and that, again, the first two score variables of the teacher rating scale contribute most to the discrimination. As before, teachers rate boys as showing less academic concentration and as more antisocial behaving than girls. These differences according to both sex and grade level duplicate the results in Analysis 1 at Autumn, and point out that, at least for teachers, the differences are minimal between handicapped and nonhandicapped students in terms of age-related factors and for the students themselves in terms of when grade is the factor on which to examine differences.

In the Autumn, there were a considerable number of significant differences among handicapped students according to the type of special education program design factor (i.e., $F = 2.094$, $df = 36/931.43$, $p < .001$). Here the multivariate dimension or principal component emerged primarily from the pattern of differences on the scales concerning perceived classroom climate. These results are reported in Table 11. The principal component which provides the maximum discrimination among the four special education program groupings would appear to be a factor called "Negative: Perceived Classroom Cognitive Emphasis, and Variety." This component is illustrated in Figure 11, where it can be seen that children in the contrast schools perceive significantly more cognitive emphasis and variety.

Spring, 1974. When the Autumn scores for these handicapped students are included as covariates in the analysis of results for the Spring, the number of sizeable correlations among the 12 score variables decrease from eight to four. Overall, the program and grade interaction effect and the main effects of grade level and sex remain as factors which discriminate among these handicapped children. The program

Table 10

Analysis 2, Autumn, 1973: Multivariate and Univariate Results and Principal Components for Main Effects of Grade Level

Multivariate Analysis

F	df	p
8.603	12/315	<.001

Univariate Analysis

Variable	F (df=1/326)	p less than	Principal Component Coefficients
1. Academic Concentration	.952	.350	.094
2. Antisocial Behavior	.144	.705	-.037
3. Outgoing, Expressive	3.697	.055	.186
4. Anxious, Depressed	5.896	.016	-.235
5. Loneliness, Rejection	7.256	.007	-.261
6. Enjoys School	.198	.657	-.043
7. Does Well In School	8.487	.004	.282
8. Misbehavior	10.498	.001	-.313
9. Enjoyment, Positive Reinforcement	30.454	.001	.534
10. Unhappiness, Misbeh.	4.437	.036	.204
11. Cognitive Emphasis	3.383	.067	-.178
12. Variety, Individualization	1.220	.270	.107

Figure 10. Principal Component Associated with Main Effect of Grade Level for Analysis 2, Autumn, 1973.

Table 11

Analysis 2, Autumn, 1973: Multivariate and Univariate Results and Principal Component Coefficients for Main Effects of Program Type

Multivariate Analysis

F	df	p
2.094	36/931.43	< .001

Univariate Analysis

Variable	F(df=3/326)	p less than	Principal Component Coefficients
1. Academic Concentration	.961	.411	.185
2. Antisocial Behavior	2.227	.085	-.291
3. Outgoing, Expressive	.447	.720	.165
4. Anxious, Depressed	1.734	.160	.293
5. Loneliness, Rejection	2.271	.080	-.035
6. Enjoys School	1.279	.282	-.076
7. Does Well in School	3.065	.028	-.142
8. Misbehavior	4.297	.005	-.113
9. Enjoyment, Positive Reinforcement	1.002	.392	.198
10. Unhappiness, Misbeh.	1.594	.191	.089
11. Cognitive Emphasis	4.118	.007	-.515
12. Variety, Individuality	3.939	.009	-.479

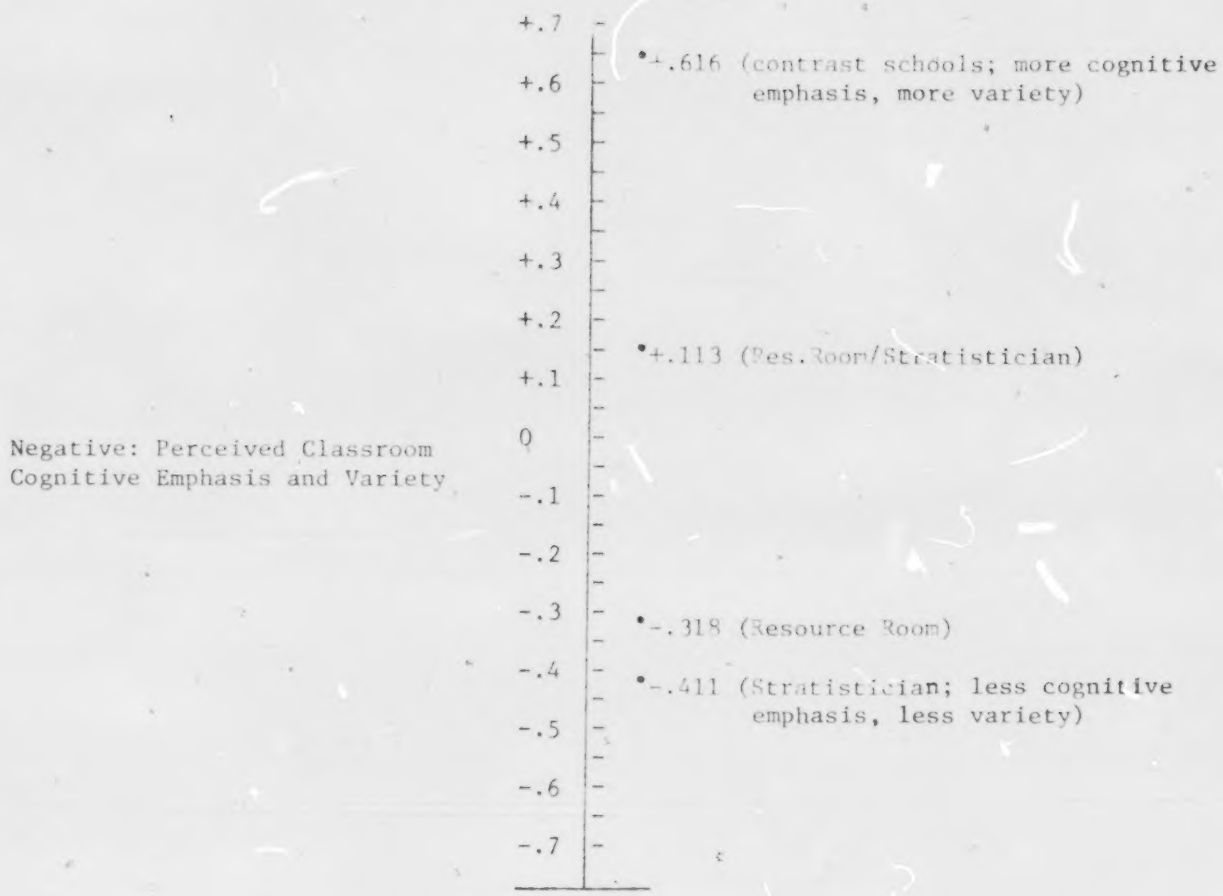

Figure 11. Principal Component Associated with Effect of Program Type for Analysis 2, Autumn, 1973.

and sex interaction effect now enters as a significant means for discrimination, and the multivariate significance of program type drops out as a source of difference. However, there is univariate significance of program type associated with scale variable 6, Enjoys School.

For the program type and grade level interaction ($F = 1.672$, $df = 36/895.98$, $p < .008$), a bipolar dimension called "Negative: Perceived Cognitive Emphasis; Positive: Loneliness and Rejection" provides some minimal discrimination here. Even though the multivariate effects are significant in this interaction, the univariate F tests for each of the 12 scale variables failed to reach significance. In short, there are now far fewer differences among handicapped children which are associated with the combined effects of program and grade when viewed over time. Whatever differences did discriminate in the previous Autumn in terms of the program and grade interaction are not sizeable enough in the following spring to substantiate a program-grade combination as a meaningful way to describe differences. For these reasons, neither tables nor figures associated with the tests of this interaction effect will be reported here.

The multivariate interaction between program type and sex does reach significance (i.e., $F = 1.759$, $df = 36/895.98$, $p < .004$) at the Spring administration. It will be recalled that this particular interaction effect was not significant during the preceding Autumn. When those Autumn scores are included in the Spring analysis, one difference occurs among the 12 scale score variables: this difference is located on scale variable 12, Variety, Individualization (i.e., univariate $F = 2.972$, $df = 3/314$, $p < .032$). It is doubtful that a statistically significant difference among the means for the program type and sex combination amounts to an educationally significant difference in any case.

Again, grade level remains a powerful way to discriminate among handicapped children when Spring data are analyzed ($F = 3.321$, $df = 12/303$, $p < .001$), and particularly in terms of teacher ratings of student Antisocial Behavior and Anxiety, Depression, and in terms of student perceptions of classroom Unhappiness, Misbehavior and Cognitive Emphasis. In the previous Autumn, grade-level differences had been associated with teacher ratings of Anxiety, Depression and with student self-evaluations of Loneliness, Does Well in School, Misbehavior and Perceived Classroom Climate regarding enjoyment. The results of

differences associated with grade level during the Spring are reported in Table 12. The principal component which now discriminates between these two grade levels might best be labeled "Negative: Perceived Cognitive Emphasis and Anxious, Depressed." This component is illustrated in Figure 12, where it can be seen that children in the lower grades perceive less cognitive emphasis than those in grades 4-6, and are rated by their teachers as somewhat more anxious and depressed than are those in grades 4-6. It is also to be noted that teachers rate handicapped students in the lower grades (1-3) as exhibiting less antisocial behavior (i.e., mean rating = 123.13) than they rate students in grades 4-6 (i.e., mean rating = 117.80). As well, older handicapped students (grades 4-6) perceive somewhat less unhappiness and misbehavior as characteristic of their classrooms (i.e., mean = 22.38) than do the young students (i.e., mean = 21.66).

Classification by sex also remains as a significant factor for distinguishing among these handicapped students, although such differences are far fewer and less significant in the Spring analysis (i.e., $F = 1.852$, $df = 12/303$, $p < .04$). In fact there are no significant univariate differences now to be found on any of the 12 scale variables when examined individually, so these data are not reported here. The principal component which does provide some discrimination is characterized by the highest weight being associated with scale variable 6, Enjoys School ($r = .393$). In this case, it is the handicapped boys who indicate they enjoy school (mean = 38.60) less than do the handicapped girls (mean = 36.45).

When the main effect of the program type is tested for the Spring administration, the multivariate F is not found to be significant (i.e., $F = 1.287$, $df = 36/895.975$, $p < .122$), although the univariate F associated with scale variable 6, Enjoys School, is significant (i.e., univariate $F = 2.960$, $df = 3/314$, $p < .033$). Apparently it is these handicapped students whose teachers were associated with the stratistician-only program (i.e., mean = 38.73) who report enjoying school less than the students in the three remaining program types; i.e., traditional resource room, mean = 37.16; resource room/ stratistician combination, mean = 36.75; and contrast schools, mean = 37.47).

As was the case when handicapped and nonhandicapped students were both included in the same sets of analyses, handicapped students only exhibit fewer differences in the Spring when compared with the Autumn analysis. The relationships between the special education program

Table 12

Analysis 2, Spring 1974: Multivariate and Univariate Results and Principal Component Coefficients for Main Effect of Grade Level

Multivariate Analysis

F	df	p
3.321	12/303	<.001

Univariate Analysis

Variable	F(df=1/314)	p less than	Principal Component Coefficients
1. Academic Concentration	.339	.561	.091
2. Antisocial Behavior	4.832	.029	-.342
3. Outgoing, Expressive	.950	.330	.152
4. Anxious, Depressed	6.605	.011	-.400
5. Loneliness, Rejection	.645	.423	.125
6. Enjoys School	.105	.747	-.050
7. Does Well In School	3.104	.079	.274
8. Misbehavior	1.129	.289	-.165
9. Enjoyment, Positive Rein.	.000	.998	.000
10. Unhappiness, Misbehavior	4.885	.028	.344
11. Cognitive Emphasis	8.328	.004	-.449
12. Variety, Individualization	.325	.569	.089

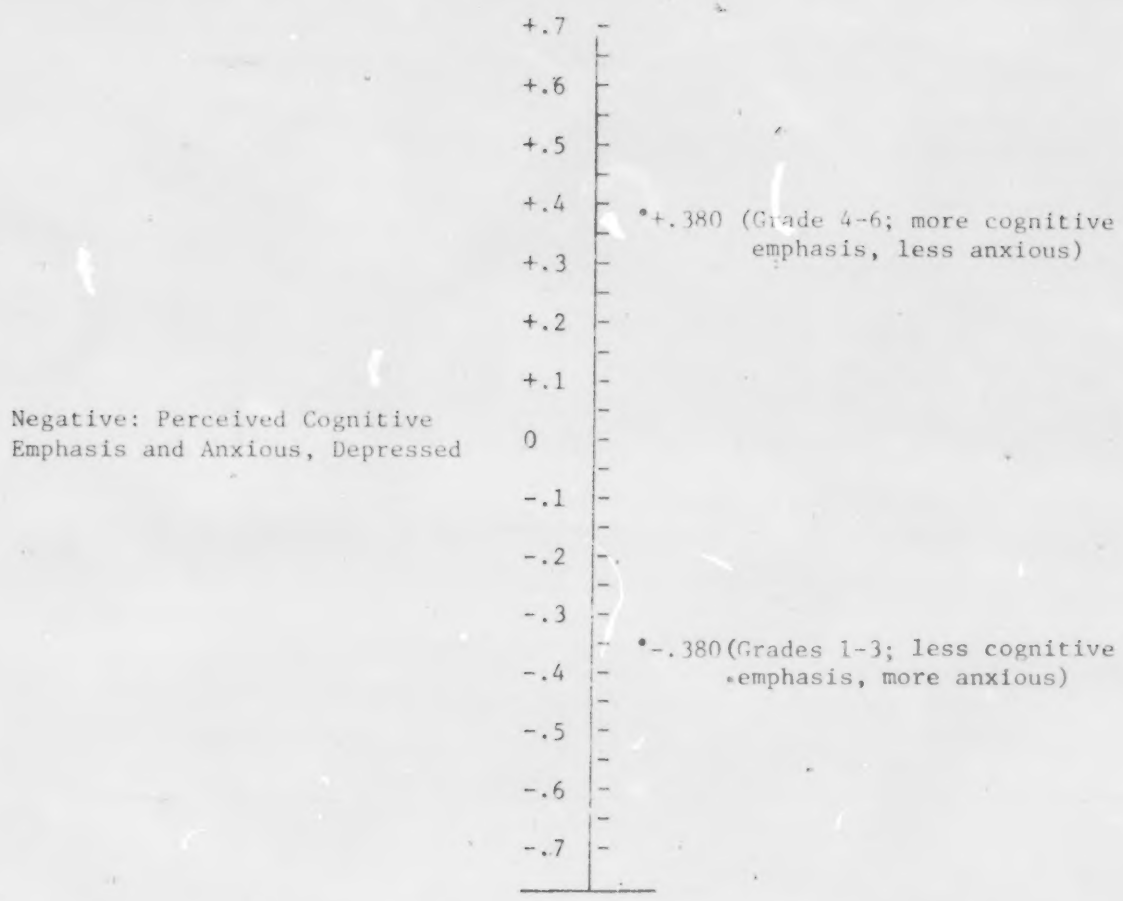

Figure 12. Principal Component Associated With Main Effect of Grade Level for Analysis 2, Spring, 1974.

factor and the variable do remain as a significant area of describing differences among students on these social-emotional variables if the interacting effects of both the student's age and sex are taken into account. The point to be made here is that generally where differences are found at the Spring, they are a new set of differences when compared with how students were different from each other in the previous Autumn. One consistent difference trend does occur when the effects of program are examined. This trend relates to the way in which differences regarding student self-evaluations of their sense of loneliness and rejection and their perceptions of classroom cognitive emphasis (as associated with program type and/or program and grade in the Autumn) are still found as variables which discriminate among them during Spring.

Academic Achievement Test Results

Using the same design factors included in the analysis of the 12 scale variables above, two additional sets of analyses were run on the results of student grade equivalent scores from the Metropolitan Achievement Test. Specifically, four scores were obtained and these were for: 1) Word Knowledge, 2) Reading, 3) Total Reading, and 4) Total Math.

Analysis 1

Autumn, 1973. The first set of analyses examined the grade equivalent scores of both handicapped and nonhandicapped students in the Autumn and again in the Spring, with the Autumn series included as covariates. As a reminder, the design factors here were 1: classification as handicapped (N = 314) or nonhandicapped (N = 1,454); 2: sex (M = 919, F = 849); and 3: grade level (1-3 = 744; 4-6 = 1,024).

As might be expected, the within-cells correlation matrix (not reported here) reveals that all four scores are highly interrelated, particularly the first three verbal measures; (i.e., $r_{1,2} = .824$, $r_{1,3} = .950$, $r_{1,4} = .662$, $r_{2,3} = .951$, $r_{2,4} = .699$, $r_{3,4} = .708$). The three-way interaction among the design factors was not significant ($F = .241$, $df = 4/1,741$, $p < .915$), nor was the two-way interaction between sex and grade level ($F = 2.059$, $df = 4/1.741$, $p < .084$). However, the interaction between the handicapped factor and grade level was significant in the Autumn (i.e., $F = 6.434$, $df = 4/1,741$, $p < .001$). Table 13 reports the results for the interaction.

Table 13

Analysis 1, Autumn, 1973: Multivariate and Univariate Results and Principal Component Coefficients for Achievement Test Scores Associated with Effects of Handicapped Status/Grade Level Interaction

Multivariate Analysis

F	df	p
6.434	4/1,741	.001

Univariate Analysis

Variable	F(df=1/1,744)	p less than	Principal Component Coefficients
1. Word Knowledge	18.936	.001	.857
2. Reading	25.118	.001	.987
3. Total Reading	24.027	.001	.965
4. Total Math.	16.294	.001	.795

The multivariate dimension seems best described as a "Reading or Verbal" component, where handicapped students at both grade levels 1-3 and 4-6 are maximally different from nonhandicapped students at both grade levels. As an illustration of these differences, the means for the Reading scores of the groups comprised by this interaction are reported in Table 14.

Table 14

Analysis 1, Autumn, 1973: Reading Score Means Associated with Interaction Between Handicapped Status and Grade Level Factors

	Grades 1-3	Grades 4-6
Handicapped	2.416	4.473
Nonhandicapped	3.140	5.700

The next higher order effect, that between handicapped status and sex, was not significant ($F = .379$, $df = 4/1,741$, $p < .824$). The multivariate main effect for handicapped status was significant (i.e., $F = 55.722$, $df = 4/1,741$, $p < .001$) as was that for the main effect of grade level (i.e., $F = 386.641$, $df = 4/1,741$, $p < .001$). However, because each of these factors was involved in its previously reported interaction, a straightforward interpretation of each is not possible, particularly since each of four variables was also significant at the univariate level under the two-way multivariate interactions. Hence, grade level and handicapped status do provide discrimination among students at the Autumn analysis, but a consideration of one of these factors must include the other when the scores on all four variables are examined.

It can be reported that the sex factor was significant (i.e., $F = 4.234$, $df = 4/1,741$, $p < .002$) for finding differences among males and females on their achievement test scores. These results are reported in Table 15. There, it can be seen that it is the univariate F's for Reading and Total Reading which provide the difference between the sexes and the definition for the principal component. The means for Reading and Total Reading are reported in Table 16, and the girls are seen to be reading at a higher level than the boys.

Table 15

Analysis 1, Autumn, 1973: Multivariate and Univariate Results and Principal Component Coefficients Associated With Effects of Sex Factor

Multivariate Analysis

F	df	p
4.234	4/1,741	<.002

Univariate Analysis

Variable	F(df=1/1,744)	p less than	Principal Component Coefficients
1. Word Knowledge	3.412	.065	.448
2. Reading	8.497	.004	.708
3. Total Reading	5.895	.015	.589
4. Total Math	.000	.983	.005

Table 16

Analysis 1, Autumn, 1973: Grade Equivalent Means for Main Effect of Sex Factor

	Reading	Total Reading
Males	3.744	3.791
Females	3.871	3.896

Spring, 1974. Our interest in examining these grade equivalent achievement scores in the Spring resides in determining whether differences found in the Autumn will still be seen to occur. Another way of asking this question is to phrase it thus: will any differences among students in the amount of their gains in grade equivalent scores betwen Autumn and Spring be associated with the design factors which were significant in the Autumn? The answer to this question is a partial yes. No interaction effects are now found to be significant, including the interaction between handicapped status and grade level (i.e., $F = .733$, $df = 4/1,737$, $p < .570$). However, both the main effects of handicapped status and grade level remain significant and their interpretation is now more stratightforward. The main effect results for the grade level factor are reported in Table 17 where it can be seen that none of the univariate F tests reached significance.

Table 17

Analysis 1, Autumn, 1973: Main Effect Results For The Grade Level Factor

Multivariate Analysis

F	df	p
3.006	4/1,737	< .017

Univariate Analysis

Variable	F(df=1/1,740)	p less than	Principal Component Coefficients
1. Word Knowledge	1.258	.262	.323
2. Reading	.681	.409	-.238
3. Total Reading	.281	.596	-.153
4. Total Math	2.609	.106	-.465

The principal component which discriminates younger from older students is clearly Total Math, and it is also clear that older students are reaching greater gains in grade equivalent scores than younger students, particularly in terms of mathematics achievement.

The main effect for the handicapped status factor was also significant ($F = 4.189$, $df = 4/1,737$, $p < .002$) and these results can be found in Table 18. The grade equivalent means for each of the four variables can be found in Table 19. There it can be seen that the handicapped students are somewhat more than one full average grade-level below the nonhandicapped students on these four measures of academic achievement in the Spring. As well, in no case do the handicapped students gain a score level at the Spring which is equivalent to the scores of non-handicapped students the preceding Autumn. In other words, even with Autumn scores used as covariates to equate for initial differences on the variables in the Spring analysis, nonhandicapped students still remain a full grade-level equivalent ahead of their handicapped peers. In any case, the fact that there are these differences in the Spring analyses is not due to the way in which these students scored in the Autumn. The differential effects of handicapped status on these measures of academic achievement are not attenuated by the passage of time spent in school from Autumn to Spring. It is to be noted, however, that the handicapped students do make considerable achievement gains of approximately one-half year grade-level equivalents between these two points in time, and that the absolute amount of their gain is comparable to that of the nonhandicapped students.

Analysis 2

Autumn, 1973. When the achievement test scores of handicapped students alone are analyzed for the Autumn, differences can be found associated primarily with an interaction between the design factors of program type and grade level and with the sex design factor. There are also main effects for grade level and program type alone but because these are bound up in a two-way interaction effect, only those variables not involved in the higher order interaction will be interpreted.

The multivariate F for the program type/grade level interaction ($F = 1.972$, $df = 8/598$, $p < .048$) was accompanied by significant univariate F's for both Reading and Total Math ($F_{Reading} = 3.323$, $df = 2/302$, $p < .037$; $F_{Total\ Math} = 3.276$, $df = 2/302$, $p < .039$). The principal component can

Table 18

Analysis 1, Spring 1974: Multivariate and Univariate Results and Principal Component Coefficients For the Main Effect of Handicapped Status Factor

Multivariate Analysis

F	df	p
4.189	4/1,737	<.002

Univariate Analysis

Variable	F(df=1/1740)	p less than	Principal Component Coefficients
1. Word Knowledge	9.482	.002	.752
2. Reading	8.027	.005	.692
3. Total Reading	10.877	.001	.805
4. Total Math.	7.810	.005	.682

Table 19

Analysis 1, Spring, 1974: Comparison of Grade Equivalent Means Associated With Main Effect of the Handicapped Status Factor For Autumn and Spring

	Word Knowledge		Reading		Total Reading		Total Math.	
	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring
Handicapped	(3.366)	3.719	(3.195)	3.552	(3.252)	3.593	(3.163)	3.605
Nonhandicapped	(4.518)	4.866	(4.419)	4.907	(4.436)	4.843	(4.004)	4.659

be defined as "Total Math and Reading," with the students whose teachers worked with stratistician-generalists being maximally different from students in the other two programs included in this analysis. That is, for example, grade 1-3 students associated with the stratistician program have the highest Reading scores as seen in Table 20 below. As well, the stratistician program students at grade level 4-6 have the lowest Reading Score mean; and again, the same grade level students in the stratisitician program have the lowest Total Math mean score for grades 4-6. Hence, the significance of program is due largely to students where teachers worked with the stratistician-generalist in combination with the student's grade level for scores on Reading and Total Math.

Table 20

Analysis 2, Autumn, 1973: Grade Equivalent Means Associated With The Program and Grade Level Interaction

Program:	Resource Room		Resource Room/Strat.		Stratistician	
Grades:	1-3	4-6	1-3	4-6	1-3	4-6
Reading	2.413	4.071	2.328	4.331	2.510	3.519
Total Math.	2.559	4.189	2.236	4.186	2.300	3.511

There were no other significant higher order effects in this Autumn analysis. The multivariate main effect of grade was significant ($F = 56.102$, $df = 4/299$, $p < .001$), but since it interacted with the program factor only, those variables not significant in that interaction will be discussed here. Table 21 reports these results.

These differences are of course self-explanatory in that grade 4-6 students score significantly higher than do grade 1-3 students, and the overall difference is best represented by a principal component dominated by Total Math.

Table 21

Analysis 2, Autumn, 1973: Multivariate and Univariate Results and Principal Component Coefficients Associated with Main Effect of Grade Level Factor

Multivariate Analysis

F	df	p
56.102	4/299	<.001

Univariate Analysis

Variable	F(df-1/302)	p less than	Principal Component Coefficients
1. Word Knowledge	110.696	.001	.699
2. Reading	131.720	.001	.762
3. Total Reading	130.188	.001	.758
4. Total Math	225.690	.001	.998

The differences according to sex are also significant in the Autumn, except for the Total Math score. Table 22 contains the results of this test. Reading is clearly the principal component which discriminates the sexes in the Autumn analysis, and it does so in favor of the handicapped girls who score at a significantly higher grade-equivalent level than do the handicapped boys. These results are equivalent to the same differences found between the sexes when non-handicapped students were included in the analysis (see Table 15, p. 46).

The final test for the Autumn analysis of handicapped students was for the multivariate significance of the program factor. Table 23 reports these results. There it can be seen that none of the F tests for the four variables reached significance.

However, because the multivariate F is significant, a multivariate dimension is provided on which the program group can be maximally differentiated. This dimension is, perhaps, best labeled as "Total Math." Again, it is

Table 22

Analysis 2, Autumn, 1973: Multivariate and Univariate Results and Principal Components Associated with Main Effect of Sex Factor

Multivariate Analysis

F	df	p
2.754	4/299	<.028

Univariate Analysis

Variable	F(df=2/302)	p less than	Principal Component Coefficients
1. Word Knowledge	5.524	.019	.705
2. Reading	8.385	.004	.868
3. Total Reading	7.563	.006	.824
4. Total Math	1.316	.252	.344

Table 23

Analysis 2, Autumn, 1973: Multivariate and Univariate Results and Principal Component Coefficients Associated with Main Effect of Program

Multivariate Analysis

F	df	p
2.138	8/598	<.031

Univariate Analysis

Variable	F(df=2/302)	p less than	Principal Component Coefficients
1. Word Knowledge	.168	.845	.168
2. Reading	.056	.946	-.013
3. Total Reading	.141	.869	.127
4. Total Math	2.283	.104	.610

the handicapped students whose teachers were associated with the stratistician-generalist who are maximally different from students in the other two groups, largely because they have the lowest Total Math grade equivalent score mean.

Spring, 1974. The analysis of the handicapped students' achievement test scores for the Spring administration yielded no significant F ratios for any of the design factors or combinations. As we have seen, this does not mean that these students did not increase their Spring scores over the previous Autumn. Rather, it means that the differences which do occur at the Spring measurement period do not reach statistical significance when the students are equated in terms of their Autumn scores. In this way, then, it is not the case that these design factors are associated with evidence that some handicapped students make significantly greater achievement test score gains than others from Autumn to Spring; i.e., gains in test scores are not seen to be due to a significant effect of grade level, sex, or special education program type. In a statistical sense, there is considerably less variance for the Spring analysis as indicated by the considerable reduction in the size of the standard deviations for each of the four achievement test variables compared with their corresponding standard deviations for the Autumn analysis. This is partly due to the inclusion of the previous Autumn test scores as covariates which deliberately "restricts" some of the variation in these Spring test scores. Nevertheless, there is not enough gain in Spring test score performance to offset the attempt at controlling the presumed effects on that performance of previous knowledge as measured during the preceding Autumn.

Again, the initial significant differences among handicapped students on Reading, Total Reading and Total Math in the Autumn according to their program type, sex and even grade level are not large enough to sustain these same effects in the Spring. By contrast, initial Autumn differences between handicapped and nonhandicapped students on Total Reading and Total Math are sufficiently large and remain so in the Spring so that the effects of handicapped status and grade level remain as significant devices for differentiation among these students. Thus, when the amount of gain in handicapped student achievement test scores is examined in relation to the student's sex, grade level and special education program type, these classification devices do not discriminate among the handicapped students.

It is to be noted, however, that these same classification factors are useful when the dependent or criterion measures are the social-emotional scales repored above. Certain of these measures which reflect significant differences in the Autumn retain their discriminating power in the following Spring. This is particularly true for 1) teacher ratings of Academic Concentration (#1), and Anxiety-Depression (#4); 2) for students' self-evaluations of Loneliness, Rejection (#5), Does Well in School (#7); and 3) for students' perceptions of Classroom Climate regarding Cognitive Emphasis (#11), and Variety, Individualization (#12). Where the significance of program type is noticeable among handicapped students it is primarily in terms of their perceptions of Classroom Climate and their self-evaluations in relation to the school situation for Loneliness; Rejection (#5) and Perceived Cognitive Emphasis (#11). Interestingly, teacher ratings provide discrimination in connection with grade level and sex, but only for Misbehavior and Anxiety-Depression.

The across-time significance of special education program type was seen to be interactive with the grade level and sex factors for the social-emotional scales, but to be nonsignificant across time for differences in the achievement test scores. Specifically, the presence of any augmenting effects of the stratistician program on the achievement test scores of handicapped students is not to be discerned in these data, although differences among students according to program type are seen in some of the social-emotional scales; viz., students associated with the stratistician program are more likely to evaluate

themselves as enjoying school less, as less lonely, as perceiving less classroom misbehavior and unhappiness, and less classroom cognitive emphasis and variety and indivudalization.

The results of these analyses can be summarized according to classes of dependent variables employed in this investigation.

Teacher Ratings

Teacher ratings discriminate most often between handicapped and nonhandicapped students; and they do so in the Autumn where teachers rate handicapped children as showing less Academic Concentration and of being less outgoing, and more anxious and depressed than their more normal peers. However, except for Academic Concentration, teacher ratings no longer distinguish between these two groups in the Spring analysis, indicating that teachers did not increase or decrease their ratings significantly enough to distinguish between the groups.

Teachers also rate older and younger students differently. Younger students are rated as consistently more misbehaving than older students, and older students as consistently more anxious and depressed than younger students. They never rate younger students as showing more Academic Concentration than older students.

Teachers also find ways of differentially rating the two sexes. In the Autumn, boys are seen by them to show less Academic Concentration and as more misbehaving than girls, but these differences do not appear as significant for teachers when they rate again in the Spring. Teachers do not find outgoingness, expressiveness, anxiousness or depression as ways of differentiating the sexes. As well, teachers' ratings, when examined with the various special education programs defined in this study, do not provide any discrimination among handicapped students whatsoever. It is only when teachers of both types of students are filling out ratings that differences according to handicapped or nonhandicapped can be found. There, teacher ratings dominate differences according to student self-image and perception of the classroom climate. One's student-status as handicapped or not seems more pronounced for teachers than it is for students.

Student Self-Image

The student's self attributions regarding loneliness and rejection, enjoying school, doing well in school and misbehaving are most prominent in terms of grade-level differences. For example, younger students are more likely to report themselves as doing better in school than are older students. But older students are also likely to say they misbehave more than younger students, at least at the beginning of the school year. For handicapped students only, the older children also report being lonelier than the younger children, who in turn say they are doing better than older students.

How students describe themselves is also related to sex, where, in the Autumn only, girls see themselves as enjoying school more and misbehaving less than the boys. These differences do not hold up when student responses are again examined the following Spring, except among handicapped children where girls still enjoy school significantly more than boys.

The only differences between handicapped and nonhandicapped children in regard to self-image across time occurs in terms of loneliness and rejection. It is the nonhandicapped students who perceive themsleves as feeling less lonely and less rejected than their handicapped peers.

Among handicapped children alone, self-image differences occur in the Autumn when examined in terms of special education program type. Again, the measures of doing well in school and of misbehaving help differentiate among students according to program type. Students in the Resource Room/Stratistician combination program saw themselves doing less well in school, but also as misbehaving less than students in the other three program types. These differences, however, were not sufficiently great enough to remain as significant discriminators across time at the Spring analysis.

Student Perception of Classroom Climate

Student perception of classroom climate regarding enjoyment, positive reinforcement, unhappiness, misbehavior, cognitive emphasis, and variety and individualization are most prominent in producing differences according to grade level. Here, perception of classroom climate scores dominate the nature of all differences associated with this age-related factor. Student classroom climate perceptions effectively distinguish older from younger students in the Autumn and Spring and primarily in terms of older students

perceiving more cognitive emphasis than younger students. Perceptions of unhappiness and misbehavior are related primarily to sex differences in the Autumn, where boys perceive more of this as characteristic of the classroom than do girls.

Cognitive emphasis, and variety and individualization discriminate handicapped students according to special education program type in the Autumn but not in the Spring. Here, students in the stratistician-only program perceive the least cognitivie emphasis and variety.

Word Knowledge

The achievement test variable, Word Knowledge, effectively discriminates students in the Autumn according to grade level, sex and handicapped status where older students, handicapped girls, and nonhandicapped students generally achieve the higher scores. It retains significance in the Spring only for discriminating between handicapped and nonhandicapped students. It does not distinguish among handicapped students according to program type and it never dominates the multivariate nature of these differences.

Reading

Like Word Knowledge, better Reading performance in the Autumn discriminates older from younger students, girls from boys, nonhandicapped from handicapped students and handicapped girls from handicapped boys. It is effective in the Spring only in terms of handicapped status where the nonhandicapped students again outperform their handicapped peers. Reading dominates the multivariate differences for sex and handicapped status, but not for grade level or program type.

Total Reading

Like Reading, better Total Reading performance is characteristic in the Autumn for older students, girls, handicapped girls and nonhandicapped students in general. It dominates the multivariate difference between the handicapped and nonhandicapped students in the Spring but not elsewhere.

Total Math

Higher Total Math performance differentiates, in the Autumn, older from younger students, handicapped girls

from handicapped boys, and nonhandicapped from handicapped students; whereas lower Total Math performance differentiates these students in the stratisician-only program from students in the other two types of programs. Total Math continues to define the multivariate nature of differences across time according to grade level, and in the Autumn according to special education program type.

In summary, of the total of the 16 dependent variables which were used in this study, the following accounted for the most effective and consistent measures on which differences were observed: a) Academic Concentration, b) Anxious, Depressed, c) Loneliness, Rejection, d) Misbehavior (self-rated), e) Cognitive Emphasis, f) Variety, Individualization, g) Reading, and h) Total Math. Among the design factors employed, those which accounted for the most variance according to the size of the F ratios were grade level, and classification as handicapped or not handicapped. Proportionately less variance was accounted for by the design factors of sex and program status.

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